

## CLAIMS:

What is claimed is:

1. A headrest for a seat of a vehicle, comprising:  
a frame attachable to the seat, and  
5 a fluid-containing bag attached to said frame, said bag being structured and arranged to allow movement of the fluid within said bag to thereby alter the shape of said bag and enable said bag to conform to the head and neck of an occupant.
2. The headrest of claim 1 wherein said bag is pre-inflated.
3. The headrest of claim 1, further comprising  
a deformable cover substantially surrounding said bag, said cover being elastically  
deformable in response to changes in pressure in said bag.
- 15 4. The headrest of claim 3, wherein said cover comprises stretch seams to allow elastic deformation of said cover.
5. The headrest of claim 1, wherein said frame is made of a rigid material.
- 20 6. The headrest of claim 1, wherein said bag contains open cell foam.
7. The headrest of claim 1, wherein the fluid in said bag is air.
8. The headrest of claim 1, further comprising  
25 a contact switch for determining when an object is in contact with the headrest.
9. The headrest of claim 1, wherein said bag includes constraining means for  
constraining flow of fluid from an upper portion of said bag to a lower portion of said bag.

10. The headrest of claim 9, wherein said constraining means comprise open cell foam .

11. The headrest of claim 9, wherein said constraining means are structured and arranged such that when said upper portion contracts, said lower portion expands.

12. The headrest of claim 1, wherein said bag is structured and arranged such that upon impact of an occupant with the headrest, fluid within said bag flows substantially within said bag to change the shape of said bag so as to approximately conform to the head and neck of the occupant thereby providing a force on the head and neck of the occupant to substantially accelerate both the head and neck at substantially the same acceleration in order to minimize whiplash injuries.

13. The headrest of claim 1, further comprising a flow restriction in said bag to permit a controlled flow of fluid out of said bag upon impact of an object with the headrest to thereby dampen the impact of the object with the headrest.

14. A seat of a vehicle, comprising:  
a seat frame,  
a bottom cushion coupled to said seat frame,  
a back cushion coupled to said seat frame,  
a headrest coupled to said seat frame, and  
a fluid-containing bag attached to said seat frame and structured and arranged to allow movement of the fluid within said bag to thereby alter the shape of said bag and enable said bag to conform to the head and neck of an occupant.

15. The seat of claim 14, wherein said bag is pre-inflated.

16. The seat of claim 14, wherein said seat frame includes at least one rod, said headrest further comprising a headrest frame attached to said at least one rod.

17. The seat of claim 14, wherein said headrest further comprises  
a deformable cover substantially surrounding said bag, said cover being elastically  
deformable in response to changes in pressure in said bag.

18. The seat of claim 14, wherein said bag contains open cell foam.

19. The seat of claim 14, wherein the fluid in said bag is air.

20. The seat of claim 14, wherein said cover comprises stretch seams to allow elastic deformation of said cover.

21. The seat of claim 14, wherein said bag includes constraining means for  
constraining flow of fluid from an upper portion of said bag to a lower portion of said bag.

22. The seat of claim 21, wherein said constraining means comprise open cell foam .

23. The seat of claim 21, wherein said constraining means are structured and arranged  
such that when said upper portion contracts, said lower portion expands.

24. The seat of claim 14, wherein said bag is structured and arranged such that upon  
impact of the occupant with said seat, fluid within said bag flows substantially within said bag to  
change the shape of said bag so as to approximately conform to the head and neck of the  
occupant thereby providing a force on the head and neck of the occupant to substantially  
accelerate both the head and neck at substantially the same acceleration in order to minimize  
whiplash injuries.

25. The seat of claim 15, further comprising

a flow restriction in said bag to permit a controlled flow of fluid out of said bag upon impact of the occupant with said seat to thereby dampen the impact of the occupant with said seat.

- 5 Sub 26. A vehicle including a cushioning arrangement for protecting an occupant in an impact, the cushioning arrangement comprising
- 10 a frame coupled to the vehicle, and
- 15 a fluid-containing bag attached to said frame, said bag being structured and arranged to allow movement of the fluid within said bag to thereby alter the shape of said bag and enable said bag to conform to a portion of an occupant engaging the cushioning arrangement,
- 20 the cushioning arrangement being arranged to be in contact with the occupant at least during the impact.

- 25 Sub 27. The vehicle of claim 26, further comprising
- 30 a deformable cover substantially surrounding said bag, said cover being elastically deformable in response to changes in pressure in said bag.

- 35 Sub 28. The vehicle of claim 26, wherein said frame is coupled to a seat of the vehicle and extends upward from a top of the seat such that the cushioning arrangement constitutes a headrest.

- 40 Sub 29. The vehicle of claim 26, wherein said bag includes constraining means for constraining flow of fluid from an upper portion to a lower portion.

- 45 Sub 30. The vehicle of claim 29, wherein said constraining means comprise open cell foam.

- 50 Sub 31. The vehicle of claim 29, wherein said constraining means are structured and arranged such that when said upper portion contracts, said lower portion expands.

32. The vehicle of claim 28, wherein the cushioning arrangement is structured and arranged such that when the occupant comes into contact with the cushioning arrangement, fluid within said bag flows substantially within said bag to change the shape of said bag so as to approximately conform to the head and neck of the occupant thereby providing a force on the head and neck of the occupant to substantially accelerate both the head and neck at substantially the same acceleration in order to minimize whiplash injuries.

33. The vehicle of claim 26, wherein the cushioning arrangement further comprises open cell foam.

34. The vehicle of claim 26, wherein the fluid in said bag is air.

35. The vehicle of claim 27, wherein said cover comprises stretch seams to allow elastic deformation of said cover.

36. The vehicle of claim 26, wherein the cushioning arrangement further comprises a flow restriction arranged in connection with said bag to permit a controlled flow of fluid out of said bag when the occupant is in contact with the cushioning arrangement to thereby dampen the impact of the occupant with the cushioning arrangement.

37. A vehicle including a protection system for protecting an occupant in an impact, the protection system comprising

an anticipatory crash sensor for determining that a crash involving the vehicle is about to occur, and

a movable cushioning arrangement coupled to said anticipatory crash sensor, said cushioning arrangement being movable toward a likely position of the occupant upon a determination by said anticipatory crash sensor that a crash involving the vehicle is about to occur.

38. The vehicle of claim 37, wherein said anticipatory crash sensor is arranged to determine that the crash involving the vehicle is a rear impact.

5 39. The vehicle of claim 37, wherein  
said cushioning arrangement comprises  
a frame coupled to the vehicle, and  
a fluid-containing bag attached to said frame, said bag being structured and  
arranged to allow movement of the fluid within said bag to thereby alter the shape of said bag  
and enable said bag to conform to the occupant.

40. The vehicle of claim 39, wherein said bag is preinflated.

15 41. The vehicle of claim 39, wherein said cushioning arrangement further comprises  
a deformable cover substantially surrounding said bag, said cover being elastically  
deformable in response to changes in pressure in said bag.

20 42. The vehicle of claim 39, wherein said frame is coupled to a seat of the vehicle and  
extends upward from a top of the seat such that said cushioning arrangement constitutes a  
headrest.

43. The vehicle of claim 42, wherein said bag includes constraining means for  
constraining flow of fluid from an upper portion to a lower portion.

25 44. The vehicle of claim 43, wherein said constraining means comprise open cell  
foam.

45. The vehicle of claim 43, wherein said constraining means are structured and  
arranged such that when said upper portion contracts, said lower portion expands.

46. The vehicle of claim 42, wherein said cushioning arrangement is structured and arranged such that when the occupant comes into contact with said cushioning arrangement, fluid within said bag flows substantially within said bag to change the shape of said bag so as to approximately conform to the head and neck of the occupant thereby providing a force on the head and neck of the occupant to substantially accelerate both the head and neck at substantially the same acceleration in order to minimize whiplash injuries.

47. The vehicle of claim 38, wherein said cushioning arrangement further comprises cell foam having openings arranged in said bag.

48. The vehicle of claim 38, wherein the fluid in said bag is air.

49. The vehicle of claim 41, wherein said cover comprises stretch seams to allow elastic deformation of said cover.

50. The vehicle of claim 38, wherein said cushioning arrangement further comprises a flow restriction arranged in connection with said bag to permit a controlled flow of fluid out of said bag when the occupant is in contact with said cushioning arrangement to thereby dampen the impact of the occupant with said cushioning arrangement.

51. The vehicle of claim 37, further comprising displacement means for moving said cushioning arrangement, and a control unit coupled to said anticipatory crash sensor and said displacement means for controlling said displacement means to move said cushioning arrangement based on the determination by said anticipatory crash sensor that a crash involving the vehicle is about to occur.

52. A method for protecting an occupant in an impact, comprising the steps of: determining that a crash involving the vehicle is about to occur, and

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moving a cushioning arrangement into contact with the occupant upon a determination that a crash involving the vehicle is about to occur.

5 53. The method of claim 52, wherein the cushioning arrangement comprises a frame coupled to the vehicle, and a fluid-containing bag attached to the frame, the bag being structured and arranged to allow movement of the fluid within the bag to thereby alter the shape of the bag and enable the bag to conform to the occupant.

54. The method of claim 53, wherein the cushioning arrangement further comprises a deformable cover substantially surrounding the bag, the cover being elastically deformable in response to changes in pressure in the bag.

55. The method of claim 53, wherein the frame is coupled to a seat of the vehicle and extends upward from a top of the seat such that the cushioning arrangement constitutes a headrest.

56. The method of claim 52, wherein the step of moving the cushioning arrangement into contact with the occupant comprises the step of:  
20 moving the cushioning arrangement toward the occupant,  
detecting when the cushioning arrangement comes into contact with the occupant and  
then  
ceasing movement of the cushioning arrangement.

25 57. The method of claim 56, wherein the step of detecting when the cushioning arrangement comes into contact with the occupant comprises the step of arranging a contact switch in connection with the cushioning arrangement.

58. The method of claim 53, further comprising the step of:



arranging a flow restriction in connection with the bag to permit a controlled flow of air out of the bag when the occupant comes into contact with the cushioning arrangement to thereby dampen the impact of the occupant with the cushioning arrangement.

59. The method of claim 52, wherein the step of determining that a crash involving the vehicle is about to occur comprises the step of determining that the crash involving the vehicle is a rear impact.

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